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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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MERCHANT & GOULD PC
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER

VALENCIA, DANIEL E

ART UNIT PAPER NUMBER

2874

DATE MAILED: 04/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/910,705

Applicant(s)

LIBORI ET AL

Examiner

Daniel E Valencia

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 04 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-61, 63-66 and 68-171 is/are pending in the application.
- 4a) Of the above claim(s) 62 and 67 is/are ~~withdrawn from consideration~~ ^{Cancelled}.
- 5) ☐ Claim(s) 66 and 68-171 is/are allowed.
- 6) ☐ Claim(s) 1-26, 32, 33, 38, 39, 41-44, 46-51, 53, 60, 61 and 63-65 is/are rejected.
- 7) ☐ Claim(s) 27-31, 34-37, 40, 45, 52 and 54-59 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 04 March 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8 6) ☐ Other: _____

DETAILED ACTION

Applicant's communication filed on March 4, 2003 has been carefully studied by the Examiner. The arguments advanced therein, considered together with the amendments made to the claims, are persuasive and the rejections based upon prior art made of record in the previous Office Action are withdrawn. Many of applicant's claims are now allowable. In view of further search, however, and the consequent discovery of previously uncited prior art document, a new rejection is applied to certain of the pending claims. This action is **not** made final.

Drawings

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on March 4, 2003 have been accepted. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

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(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-4, 7, 8, 11, 12, 14, 16-21, 24-26, 32, 33, 38, 39, 42, 44, 46-51, 53, 60, 61, and 63-65 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang U.S. 6,418,258 (newly cited). Refer to the appropriate drawings or parts of the specification. Wang discloses a microstructured optical fiber with improved transmission efficiency and durability with all the limitations of the abovementioned claims. Regarding claim 1, Wang discloses a micro-structured optical fiber for transmitting at least a predetermined wavelength of light (fig 2), said optical fiber having an axial direction and a cross section perpendicular to said axial direction, said optical fiber comprising: a core region (202) having a multiplicity of spaced apart core features (204) that are elongated in the fiber axial direction and disposed in a core material, said core region having an effective index of N_{co} , a cladding region (208) surrounding said core region, said cladding region comprising a multiplicity of spaced apart cladding features (210) that are elongated in the fiber axial direction and disposed in a first cladding material, and said cladding region having an effective index of refraction N_{cl} , wherein a plurality of said cladding features have a cross sectional dimension perpendicular to said axial direction being larger than said predetermined wavelength, and wherein one or more of said cladding features are voids (col. 3, lines 64-bottom). Wang further discloses that the effective refractive index of the core region N_{co} is larger than the effective refractive index of the cladding region, N_{cl} , at a predetermined wavelength of light (col. 4, lines 12-14), as mentioned in instant claim 2. With reference to claims 3, 4, 7, and 8, Wang discloses

that the core and cladding features have a lower refractive index than the material around it (col. 3, lines 60-bottom). Wang further discloses that the predetermined wavelength is selected from wavelengths in the interval of 1.2 to 1.6 microns, and is about 1.3 microns or 1.55 microns (col. 4, line 29), as mentioned in instant claims 11 and 14. Wang discloses that the predetermined wavelength can be in the range 0.6 to 1.2 microns (col. 11, lines 10-25), as mentioned 12. Wang discloses that the predetermined wavelength can be selected from wavelengths in the interval of 1.5 to 1.6 microns, specifically 1.55 microns. Wang further discloses that the optical fiber transmits all the wavelengths within the range in single mode of propagation (col. 6, lines 55-60), as described in instant claims 18 and 19. Although Wang does not explicitly state that the device can propagate wavelengths down to 0.3 microns, as mentioned in claim 20, it would be inherently disclosed that the microstructured could propagate the visible spectrum down to this lower limit of wavelength. Wang's disclosure depicts that the core features have cross section dimensions perpendicular to the axial direction being smaller than the cross sectional dimensions of the cladding features (fig. 2), as explained in instant claim 21. As to claims 24 and 25, Wang discloses that part of or all of the core features have cross sectional dimension perpendicular to said axial direction being smaller than said predetermined wavelength (col. 6, line 60- col. 7, line 10). Although Wang does not explicitly state that the dimensions of the core features are large enough so that the second order propagation is shifted to a wavelength of light being shorter or smaller than said predetermined wavelength as described in instant claim 26, this would be an inherent property of any

type of photonic clad fiber. Wang discloses that the core features occupy in total a ratio F_c of the core region, and the cladding features in the cross section occupy in total a ratio F_i of the cladding region, and F_c is smaller than F_i (col. 6, lines 30-40), as described in claim 32. With regards to claim 33, Wang discloses that the cladding features are periodical (col. 4, line 5). Referring to claim 38, Wang's disclosure depicts that the center-to-center spacing of the core features is smaller than the center-to-center cladding features. Wang's disclosure shows that the core region has core features that are more than the required amounts in the claims (fig 2), as mentioned in instant claims 39. Regarding claims 42, 44, and 53, Wang discloses that the core and cladding material can be made of silica (col. 3, lines 60-65). With reference to claims 46 and 47, Wang discloses that the core region has a diameter larger than 2 microns (col. 6, line 63). Wang further discloses that the cladding features have a diameter or cross sectional dimension being larger than 0.45 times the center-to-center spacing of said cladding features (fig 2 and col. 7, lines top-15), as explained in instant claim 48. As to claim 49, Wang's disclosure shows that the cladding features occupy at least 25% or more of the cladding region. Regarding claim 50, Wang's disclosure shows that the core features occupy more than 5% of the cross section of the core region (fig 2). Wang discloses that the core and cladding features can be distributed periodically (col. 4, line 5), as mentioned in claim 51. Wang further discloses that the core or the cladding features can be voids filled with air, vacuum, gas, or some other medium (col. 3, lines 60-bottom), as described in instant claims 60-65.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 6, 9, 10, 13, 15, 22, 23, 41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang. Refer to the appropriate drawings or parts of the specification. Wang as applied above, discloses a microstructured optical fiber having a majority of the limitations of the present invention. Although Wang does not explicitly state that one or more of the core or cladding features have a refractive index that is greater than the surrounding material as described in claims 5, 6, 9, and 10, Wang teaches that different materials can be used to affect the effective refractive index by increasing it or decreasing it (col. 5, lines 60-bottom). Therefore, it would have been obvious to one of ordinary skill at the time of invention to use features of a higher index than the surrounding material.

As to claims 13 and 15, Wang discloses that his invention can be used over a wide spectrum, including a range of predetermined wavelengths including the wavelengths of claims 13 and 15 (col. 11, 11-21).

Regarding claims 22 and 23, Wang discloses that the core features have an outside diameter of about 0.1 microns. The figures show that there is little spacing between the features, making the center-to-center spacing just over about 0.1 microns,

which is less than the predetermined wavelength (1.55um). Additionally, 0.1um is less than 0.9 of 1.55um, as required by claim 23. Therefore, these limitations are made obvious by some calculations of Wang's dimensions.

With reference to claims 41 and 43, Wang discloses that the core and the cladding can be doped with index modifying dopants to aid in guiding the light through the fiber. One of ordinary skill in the art would be motivated by this teaching to adjust the effective difference in refractive indexes between the core and cladding materials using dopants, as mentioned in claims 41 and 43. Therefore, it would have been obvious at the time of invention.

Allowable Subject Matter

Claims 66 and 68-171 are allowed.

Claims 27-31, 34-37, 40, 45, 52, and 54-59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: As to dependent claims 27, 29, and 52, the prior art alone or in combination fails to disclose or render obvious a micro structured optical fiber according to claim 26, and wherein a part of the core or cladding features have a cross-sectional dimension being larger than 0.2um. For example, Wang, as the closest prior art, discloses that the core features have a diameter of about 0.1um.

Regarding dependent claims 28 and 31, the prior art alone or in combination fails to disclose or render obvious a micro-structured optical fiber according to claim 26, wherein a part or all of the core features have a cross sectional dimension perpendicular to said axial direction being so large that the second order mode of propagation is shifted to a wavelength of light being shorter than 1.5 μ m. Wang does not teach or suggest this limitation anywhere in the reference.

As to dependent claims 30 and 34, the prior art alone or in combination fails to disclose or render obvious a micro-structured optical fiber according to claim 2, wherein the fiber has been dimensioned so that the value of the effective index of refraction of the core region, N_{co} , for wavelengths of lights below a shifting wavelength, said shifting wavelength having a value smaller than said predetermined wavelength. Wang does not teach or suggest this limitation anywhere in the reference.

Referring to dependent claim 35, the prior art alone or in combination fails to disclose or render obvious a micro-structured optical fiber according to claims 33 or 34, wherein the core features have a cross-sectional dimensions perpendicular to said axial direction being larger than the cross sectional dimensions of the cladding features. For example, Wang shows that the core features are smaller than the cladding features, which is the opposite of what the claim requires.

Regarding dependent claim 36, the prior art alone or in combination fails to disclose or render obvious a micro-structured optical fiber according to claim 33, wherein the core features in the cross-section occupy on total a ratio F_c of the core region, and the cladding features in the cross section occupy in total a ratio F_i of the

cladding region, and F_c is larger than F_i . The Wang reference teaches that F_i is larger than F_c , the opposite of what the claim requires.

As to dependent claim 37, the prior art alone or in combination fails to disclose or render obvious a microstructures optical fiber according to claim 1, therein the core features have a center-to-center spacing being substantially equal to the center-to-center spacing of the cladding features. For example, the Wang reference shows that the center spacing of the core features is smaller than that of the cladding features.

With reference to claim 40, the prior art alone or in combination fails to disclose or render obvious a microstructured optical fiber according to claim 1, wherein the number of core features is equal to 7, 13, or 19. Wang's disclosure shows more than 19.

Regarding claim 45, the prior art alone or in combination fails to disclose or render obvious a micro-structured optical fiber according to claim 1, wherein at least 60% of the cladding features have a cross sectional dimension perpendicular to said axial direction being larger than the wavelength of light guided by the fiber. Wang discloses that the core and the cladding features are smaller than any of the predetermined wavelength.

As to dependent claims 54-59, the prior art alone or in combination fails to disclose or render obvious the microstructured optical fiber according to claim 1, wherein the core or cladding features are rods. For example, Wang only discloses the use of voids and makes no mention of the use of rods.

As to independent claims 66, 69, and 131, the prior art alone or in combination fails to disclose or render obvious an article comprising a micro-structured optical fiber for guiding light at an operating wavelength, said optical fiber having an axial direction and a cross section perpendicular to said axial direction, the optical fiber comprising: a core region having an effective refractive index N_{co} and being surrounded by a cladding region comprising a multiplicity of spaced apart cladding features being elongated in the axial direction and disposed in a first cladding material, the cladding features having a refractive index that differs from a refractive index of the first cladding material, the cladding region further comprising an inner cladding region surrounding the core region and an outer cladding region surrounding the inner cladding region, the inner cladding region having an effective refractive index N_i and the outer cladding region having an effective refractive index N_o , with N_i being larger than N_o at the operating wavelength, therein the inner cladding region comprises the first cladding material and the cladding features disposed therein, the first cladding material thereby constituting an inner cladding material and the cladding features disposed in the first cladding material constituting a multiplicity of spaced apart inner cladding features. For example, Wang discloses one cladding layer with features, but not two. In addition, neither of the Giovanni references made of record in the previous Office Actions discloses all the limitations of the present invention.

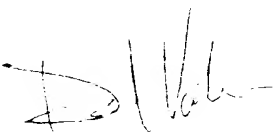
Conclusion

The prior art documents submitted by the applicant in the Information Disclosure Statement filed on March 4, 2003, have all been considered and made of record (note attached copy of form PTO-1449).

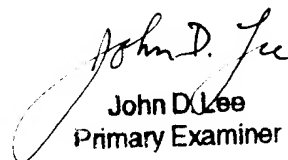
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel E Valencia whose telephone number is (703)-305-4399. The examiner can normally be reached on Monday-Friday 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (703)-308-4819. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-308-7724 for regular communications and (703)-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.



dv
April 9, 2003



John D. Lee
Primary Examiner